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10/531,941	04/19/2005	Carlo Casale	IT 020028	4331

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EXAMINER	
KOZIOL, STEPHEN R	
ART UNIT	PAPER NUMBER
2624	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/531,941	CASALE ET AL.	
	Examiner	Art Unit	
	STEPHEN R. KOZIOL	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08/28/2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 16-20* is/are rejected.

7)☒ Claim(s) *13-15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. Amendments and Remarks filed August 28, 2008 have been entered and considered, but are not fully persuasive. Claims 1-20 have been amended without adding new matter.

Response to Arguments

2. *Response to Applicants' Remarks:*

Regarding independent claims 1, Applicants argue Scognamiglio's use of both horizontal and vertical extracted image edge information does not teach the claimed limitation of "determining a peaking factor by using a predetermined enhancement function allocating values for the peaking factor to combinations of values of the first detector signal and the second detector signal multiplying the first detector signal with the peaking factor to obtain a peaked input signal" at least because Scognamiglio's extracted edge data are of two different spatial directions (i.e. horizontal and vertical). In contrast, Claim 1 requires the first and second subsets of edges to be detected in the same spatial direction.

Examiner does not necessarily disagree with Applicants' characterization of Scognamiglio with regard to claim 1 (see "Remarks / Discussion of the Issues" pp. 11-12). However, Scognamiglio is still interpreted to the limitations of claim 1 as indicated in the previous Office action. While Scognamiglio does extract subsets of edges in both a horizontal and vertical direction (see, e.g. Fig. 4 "HLPP" and "VLHP"), Scognamiglio also detects a subset of edge data using the "horizontal (and vertical) control function" blocks (Fig. 4 "HCF" and "VCF"). For example, the HFC, in addition to providing control functionality, detects edge information of the input signal to avoid noise amplification, overshooting sharp edges, and temporal artifacts (see Scognamiglio column 6 lines 37-43). Hence, the "HLHP" and the "HCF"

represent two subsets of detected edge data obtained in the same spatial direction (horizontal) used to enhance the sharpness of the input signal. Furthermore, Applicants' use of the open-ended transitional phase "comprising" in claim 1 does not preclude Scognamiglio use of edge detection in more than one different spatial direction. Accordingly, the rejection of claims 1-12 and 16-20 under 35 U.S.C. § 103(a), as indicated in the previous Office action, is respectfully maintained.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> The factual inquiries set forth in **Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966)**, that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows: ***(See MPEP Ch. 2141)***
>
> a. Determining the scope and contents of the prior art;
> b. Ascertaining the differences between the prior art and the claims in issue;
> c. Resolving the level of ordinary skill in the pertinent art; and
> d. Evaluating evidence of secondary considerations for indicating obviousness or nonobviousness.

4. Claims 1-12 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scognamiglio et al. U.S. 6,847,738 ("Scognamiglio") in view of Gallagher U.S. Pre-Grant Application Publication 2003/0161545 A1 ("Gallagher") for the same reasons indicated in the previous Office action.

Regarding claims 1 and 19 Scognamiglio teaches a sharpness enhancement method and circuit comprising:

i. a first edge detector for detecting in a first spatial direction a first subset of edges in the input signal to obtain a first detector signal *(Scognamiglio col. 5 lines 40-59 as shown in Figs. 3 and 4),*

ii. a second edge detector for detecting in the first spatial direction a second subset of edges in the input signal to obtain a second detector signal, said second subset being different from the first subset *(Scognamiglio col. 5 lines 40-59 as shown in Figs. 3 and 4),*,

iii. a means for determining a peaking factor by using a predetermined enhancement function allocating values for the peaking factor to combinations of values of the first detector signal and the second detector signal *(Scognamiglio col. 6 lines 19-34 where C.sub.x(n,m,t) acts as the "enhancement function" that contributes to determining the peaking factor of first and second high-pass filtered input signals)*, and

iv. a multiplier for multiplying the first detector signal with the peaking factor to obtain a peaked input signal *(Scognamiglio col. 6 lines 19-34 Fig. 4 where M2 multiplies the first signal with C.sub.x(n,m,t))*.

Scognamiglio's method is generally directed to three-dimensional video data (as indicated by terms such as C.sub.x(n,m,t)). Therefore, strictly speaking, Scognamiglio is silent on the teaching using a two-dimensional enhancement function, as recited in claims 1 and 19. However, Gallagher teaches a similar image sharpness enhancement system directed to two-dimensional enhancement functions (see Gallagher ¶0051). Therefore, a person having ordinary skill in the image processing arts at the time of the invention would have found it obvious to apply the three-dimensional video image sharpness enhancement techniques as taught by Scognamiglio using two-dimension image sharpness enhancement methods taught by Gallagher

for the well-known and expected benefits of sharpness enhancement on 2-D (image) as well as 3-D (video) input signals.

Regarding claim 2 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 1, wherein

i. the detecting the first subset of edges comprises high-pass filtering the input image signal to obtain a high-pass filtered signal *(Scognamiglio col. 5 lines 40-59 as shown in Figs. 3 and 4)*,

ii. the detecting the second subset of edges comprises band-pass filtering the input image signal to obtain a band-pass filtered signal *(Scognamiglio Fig. 5 and col. 6 lines 65-67 where the input signal s(n,m,t) is received and subsequently a band-pass filter is applied to obtain a band-pass filtered signal)*,

iii. the determining the peaking factor by using a predetermined two-dimensional enhancement function being adapted for allocating values for the peaking factor to combinations of values of the high-pass filtered signal and the band-pass filtered signal *(Scognamiglio col. 6 lines 19-34 where C.sub.x(n,m,t) acts as the "enhancement function" that contributes to determining the peaking factor of first and second high-pass filtered input signals)*, and

iv. multiplying the high-pass filtered signal with a multiplying factor based on the peaking factor *(Scognamiglio col. 6 lines 19-34 where M2 multiplies the first signal with C.sub.x(n,m,t))*.

Regarding claim 3 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 2, wherein

i. the high-pass filtering comprises horizontal high-pass filtering a horizontal component of the input image signal to obtain a horizontal high-pass filtered signal *(Scognamiglio col. 6 lines 4-18)*,

ii. the band-pass filtering comprises horizontal band-pass filtering the horizontal component of the input image signal to obtain a horizontal band-pass filtered signal *(Scognamiglio col. 6 lines 4-18 and col. 6 lines 65-67)*, and

iii. the determining of the peaking factor comprises using a predetermined two-dimensional horizontal enhancement function for allocating values for a horizontal peaking factor to combinations of values of the horizontal high-pass filtered signal and the horizontal band-pass filtered signal *(Scognamiglio col. 6 lines 19-34 Fig. 4 item M2)*.

Regarding claim 4 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 3, wherein said horizontal enhancement function has a relatively low value if

(i) a value of the horizontal high-pass filtered signal and a value of the horizontal band-pass filtered signal are substantially equal,

(ii) the value of the horizontal high-pass filtered signal is larger than a first predetermined value, or

(iii) the value of the horizontal band-pass filtered signal is larger than a second predetermined value (*Scognamiglio col. 7 line 55 thru col. 8 line 10*), and wherein,

if (i) is not valid, said horizontal enhancement function has a relatively high value if:

(iv) the value of the horizontal high-pass filtered signal is smaller than the first predetermined value, or

(v) the value of the horizontal band-pass filtered signal is smaller than the second predetermined value (*Scognamiglio col. 7 line 55 thru col. 8 line 10*).

Claim 5 has been analyzed and is rejected for the reasons indicated re claim 3 above, as Scognamiglio performs both horizontal and vertical high- and band-pass filtering.

Claim 6 has been analyzed and is rejected for the reasons indicated re claim 4 above, as Scognamiglio checks both horizontal and vertical high- and band-pass filtered signals.

Regarding claim 7 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 5, wherein the

i. multiplying comprises multiplying the horizontal high pass filtered signal with the horizontal peaking factor to obtain a horizontal correction factor (*Scognamiglio, col. 6 lines 19-43 and Fig. 4 item M2*),

ii. multiplying the vertical high pass filtered signal with the vertical peaking factor to obtain a vertical correction factor (*Scognamiglio, col. 6 lines 19-34 Fig. 4 item M3*),

iii. summing the horizontal correction factor and the vertical correction factor to obtain a total correction factor, and summing the total correction factor to the input image signal (*Scognamiglio, col. 6 lines 19-34 Fig. 4 item A2*).

Regarding claim 8 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 7, but Scognamiglio is silent on the method wherein the summing of the horizontal correction factor and the vertical correction factor comprises weighting the horizontal correction factor with a horizontal weighting factor, and the vertical correction factor with a vertical weighting factor, wherein the horizontal weighting factor has a lower value when the vertical correction factor surpasses a first threshold, and wherein the vertical weighting factor has a lower

value when the horizontal correction factor surpasses a second threshold. However, official notice is taken to note that the uses and benefits of horizontal and vertical weighting factors applied to generate a corrected image signal are well know and expected in the image processing arts and would have been obvious to incorporate into the system of Scognamiglio and Gallagher for the benefit of generating a corrected image signal.

Regarding claim 9 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 7, wherein the method further comprises determining a level of noise being present in the input image signal, and modifying the horizontal peaking factor and/or vertical peaking factor in dependence on the level of noise in order to reduce an enhancement of noise (*Scognamiglio col. 5 lines 40-59)*.

Regarding claim 10 Gallagher further teaches the method of claim 9 wherein the determining of the level of noise comprises estimating a standard deviation of the noise *(Gallagher, ¶¶0037-41)*.

Regarding claims 11 and 12 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 3, wherein the input image signal represents an image formed by a matrix of pixels, a position of a pixel in the matrix being defined by indices m,n wherein the index n indicates a horizontal position and the index m indicates a vertical position, and wherein the horizontal and vertical high-pass filtering comprises Laplacian filtering defined by Zx(m,n)=2L(m,n)-L(m,n-1)-L(m,n+1), and wherein the horizontal and vertical band-pass filtering comprises filtering defined by Dx(m,n)=L(m,n+1)-L(m,n-1), and wherein L(m,n) is related to the luminance of a pixel at position m,n, L(m,n-1) is related to the luminance of a pixel

at position m,n-1, and L(m,n+1) is related to the luminance of a pixel at position m,n+1 (*Scognamiglio col. 6 lines 4-18 as shown in Eq. 2.3).*

Regarding claim 16 Scognamiglio teaches a method of sharpness enhancement as claimed in claim 1, wherein

i. the detecting the first subset of edges comprises high-pass filtering the input image signal to obtain a first high-pass filtered signal *(Scognamiglio, col. 5 lines 40-59),*

ii. the detecting the second subset of edges comprises high-pass filtering the input image signal to obtain a second high-pass filtered signal *(Scognamiglio, col. 5 lines 40-59)*,

iii. the determining the peaking factor by using a predetermined two-dimensional enhancement function being adapted for allocating values for the peaking factor to combinations of values of the first high-pass filtered signal and the second high-pass filtered signal, and multiplying the first high-pass filtered signal with the peaking factor *(Scognamiglio, col. 6 lines 19-34 and Fig. 4 item M2).*

Regarding claim 17 and 18 Scognamiglio teaches a method of sharpness enhancement as claimed in claims 16 and 17 respectively, wherein

i. the first high-pass filtering comprises horizontal and vertical high-pass filtering a horizontal and vertical component of the input image signal to obtain a first horizontal high-pass filtered signal (*Scognamiglio, col. 6 lines 4-18)*,

ii. the second high-pass filtering comprises horizontal high-pass filtering the horizontal and vertical component of the input image signal to obtain a second horizontal and vertical band-pass filtered signal (*Scognamiglio, col. 6 lines 4-18)*, and

iii. the determining of the peaking factor comprises using a predetermined two-dimensional horizontal and vertical enhancement function for allocating values for a horizontal and vertical peaking factor to combinations of values of the first horizontal and vertical high-pass filtered signal and the second horizontal and vertical high-pass filtered signal *(Scognamiglio, col. 6 lines 19-34 and Fig. 4 item M2).*

Regarding claim 20 Scognamiglio teaches a display apparatus comprising a matrix display and a sharpness enhancement circuit as claimed in claim 19 (*Scognamiglio, Fig. 3item D, as described in col. 5 lines 58-59, where the output signal is displayed on display device D*).

Allowable Subject Matter

5. Claims are 13-15 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

6. Applicants' amendments necessitated the new grounds of rejection set forth herein. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however,

event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action

Contact

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steve Koziol whose telephone number is (571) 270-1844. The examiner can normally be reached on Monday - Friday 9:00 - 5:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir Ahmed can be reached at (571) 272-7413 . Customer Service can be reached at (571) 272-2600. The fax number for the organization where this application or proceeding is assigned is (571) 273-7332.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

12/07/2008
/srk/

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